

Warning HGV driver against overturning in negotiation of curve

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Abstract of DE4416991

The vehicle approaching a curve (11) of the carriageway (10) passes over a threshold (12) equipped with two wheel-road sensors (14,14') in line abreast, from whose readings the all-up wt. is computed while the type of vehicle is identified and its speed over the threshold measured. The computer allows for the radius of curvature and the position of the centre of gravity in determin. of the risk of overturning at the measured speed. The latter is monitored by follow-up sensors (19) on the outside of the curve, linked to warning LEDs (18) on spaced posts (17).

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As well as the invention refers to a method for warning the drivers of trucks before tilting danger with driving along curves, with before the retraction of a vehicle into a curve the motor vehicle type and for tilting danger with through drives to this curve relevant status datas, like vehicle weight and traveling speed, detected becomes in response of the center of gravity of the vehicle mass and of the turning radius the tilting risk when driving through the curve with the detected traveling speed determined and at least superelevated traveling speed an indicative signal with determined tilting danger and/or. when falling below a pre-determined safety margin the tilting danger triggered becomes.

Furthermore the invention refers to a mechanism for accomplishing the aforementioned method.

A method and a mechanism for warning the drivers of trucks before tilting danger with driving along curves are already known. It concerns that before the retraction of a vehicle into a curve the total weight of the vehicle and the traveling speed become by means of suitable sensors detected and consideration of the turning radius determined bottom for the respective Fahrzeugklasse, whether when driving through the curve with the determined traveling speed tilting danger exists. With tilting danger and/or. Falling below a predetermined safety margin to the tilting danger and the speed decrease requesting signals referring to triggered and the display brought become on superelevated speed.

With the previously known system dependent critical speed determined, the current traveling speed with this critical speed compared and a warning signal triggered, justifying of the determined weight and type of the respective vehicle a tilting danger, becomes, if the current traveling speed falls below a predetermined safety margin of the critical speed. Unsatisfactory one with this system is that an individual vehicle collection takes place only regarding the respective vehicle weight and motor vehicle type, not however a detection of the loading condition. The tilting danger becomes however substantial of their loading condition and thus if necessary caused shifts of emphasis influenced, with trucks.

Accordingly are to become by the invention a method the above of the type and purpose as well as one procedure execution serving mechanism provided, which warn the driver traveling speed superelevated by trucks when driving on curves bottom consideration of the respective loading condition before make possible.

In process engineering respect this object is according to invention by the fact dissolved that detected with methods for the determination of the total weight of the respective vehicle, indicated in the preamble of the claim 1, its wheel loads become einz that with it the simultaneous imbalance on both wheel sides and/or. the off-setting of the vehicle emphasis in lateral direction found becomes and that the determination of the tilting risk bottom consideration of this imbalance and/or. the off-setting of the vehicle emphasis made.

Contrary to it concerns mentioned above states of the art with the invention that with the determination of the tilting risk the imbalance and thus a possible off-setting of the vehicle emphasis determined between both wheel sides become regarding the Fahrzeulgängsac

considered. A possible off-setting of the vehicle emphasis can result for example from the charge distribution and increase in addition, reduce the tilting danger.

An other specifying of the warning procedure according to invention can become achieved, if in accordance with a development apart from D total weight of the respective vehicle its height and/or. High outline detected and in response of it and on the basis predetermined data for the determined motor vehicle type a weight-dependent estimate of the level of the vehicle emphasis made becomes.

As meaningful also another development proved going by that before and with the retraction of a vehicle into a curve its traveling speed current measured and superelevated traveling speed indicative signals become triggered until the traveling speed measured in each case is reduced on a measure excluding any tilting risk. In accordance with this development thus the driver of a truck becomes current an adaptation its traveling speed to the curve section prompted located before it.

Likewise in accordance with a development of the invention process their radius over the steering angle of the steering wheel or the directed vehicle axle of the respective vehicle certain and the traveling speed can be consulted on the basis the vehicle speedometer determined and for the judgment of the tilting danger also when driving on a curve.

Particularly convenient is, if become accordingly processed in accordance with a however times development of the invention by means of in each case an vehicle-own speed alarm system transmitted and direct data of the respective vehicle both from the outside and for the judgment of the tilting danger used.

As particularly meaningful proved to that extent, if the slip of the wheels of the respective vehicle on the roadway and/or regarding slip hazard the road condition determined as well as with the judgment of the tilting danger considered becomes. In particular the humidity condition of the roadway can become detected for the judgment of the slip hazard. Finally also as meaningful proved to release when falling below a predetermined mature coefficient of adhesion slip hazard an indicative signal which warns independent of tilting danger an indicative signal the driver of a motor vehicle before slip hazard.

Regarding the mechanism for accomplishing the invention process the object placed to that extent is dissolved by the fact that in as straight a distance section before a curve as possible at least two wheel load sensors located in a line transverse to the direction of travel are provided for seizing the right in each case and left wheel loads of a vehicle when over driving the measuring threshold.

A so formed measuring threshold supplies the total weight by accumulation of the wheel loads determined at the single wheel load sensors, in addition in addition, by detection possible different wheel loads on both vehicle sides a present imbalance and thus a statement over a possible off-setting of the vehicle emphasis. According to whether the center of gravity of the vehicle is in the respect on the vehicle longitudinal axis after or other side a displaced, this leads when driving on a curve to an increase or a reduction of the tilting danger. In response of the position of the center of gravity the traveling speed must become when driving through a curve around a larger measure than with on the vehicle longitudinal axis located or after the other side displaced vehicle emphasis reduced therefore if necessary.

In addition, the mechanism can be corresponding to claim 2 also by the fact characterized that before the curve a sensor for seizing the height and/or. High outline of the respective vehicle provided is, so that in response of the measurement values detected by means of this sensor an individual estimate of the level of the entire vehicle emphasis is possible.

Corresponding ones to the method in accordance with claim 3 can be during the mechanism also in direction of travel the rear measuring threshold one on the other subsequent velocity sensors to the current detection of the current in each case traveling speed provided, which a releasing of warning signals obtain, until the current traveling speed is reduced on a measure, with which no tilting danger exists.

Another development of the mechanism according to invention plans that is provided as signal transmitters to the display of superelevated traveling speed at at least an edge of the roadway at

least an active light post. In addition, instead a signal generator chain can be out along at least an edge of the roadway in direction of travel spaced from each other disposed light post provided.

In the frame of the mechanism according to invention also provided can be that are provided for vehicles at the roadside, equipped with corresponding receipt and/or transmitting plants, at least a transmitter as signal transmitters and/or a receiver for the exchange of relevant data. So for example data can become over the turning radius, the vehicle weight and the current traveling speed expenditure exchange.

On the basis the accompanying drawing the appended mechanism is to become warning the drivers of trucks before tilting danger with driving along curves and with this mechanism feasible methods explained. To schematic views point

Fig. 1 an area cutout with a roadway, which is in the region of a curve with a warning device equipped, which exhibits in direction of travel before the curve disposed a measuring threshold as well as in direction of travel after this measuring threshold an indicating panel and several guidance posts with activatable signal transmitters, successive along the edges of the lane,

Fig. 2 a standard truck in a side view and

Fig. 3 the truck after Fig. 2 in a rear view.

With in Fig. 1 illustrated roadway 10 is in the bringing in range before a curve 11 a measuring threshold 12 with two in a line transverse to the direction of travel located wheel load sensors 14, 14 min disposed suggested by the arrow 13, which seize with the over-driven wheel loads on the right and left side of the respective vehicle separate and which by means of other interesting and also not represented computer do not make determination possible of the vehicle total weight here.

Simultaneous one will the motor vehicle type and the current traveling speed when over driving the measuring threshold 12 detected and it becomes into response of the turning radius and the layer of the entire emphasis of the vehicle determined whether when driving through the curve with the determined traveling speed tilting danger exists or a sufficient safety margin is to a tilting danger justifying traveling speed granted.

On a side of the roadway 10 an indicating panel 16 is to the warning of the drivers speed superelevated by trucks before with the retraction into the curve disposed and along the two edges of the lane follows in direction of travel spaced one on the other in each case before the curve 11 at an edge of the lane in direction of travel the rear measuring threshold 12 as if activate signal transmitter formed guidance posts 17. Everyone this guidance post possesses an activatable LED as signal indicator 18, by means of which in response of the determined traveling speed of a vehicle warning signals are conveyable to the vehicle operator.

Likewise in direction of travel the rear measuring threshold 12 and in the region of the curve 11 located one on the other subsequent velocity sensors are already 19 disposed, which make a current monitoring for the traveling speed possible when driving through the curve and which beispielswe obtain display of warning signals by the activatable LED displays 18 the guidance post 17 until the traveling speed a bottom any tilting danger excluding measure reduced is.

Into the Fig. 2 and 3 is a standard truck 20 with two axes 21, 21 min illustrated, whose entire emphasis S lies in a distance h over the roadway 10. When rolling over the measuring threshold 12 the two wheel load sensors 14, 14 min of the measuring threshold located in a line transverse to the roadway measure the one on the other subsequent at the right in each case and left wheels 22, 22 min and/or. 23, 23 min of the two axes arising wheel loads. The addition of the right in each case and left wheel loads R_r, g 1 the possible determination of the axle load A and the addition of the two axle load lead to the total weight G of the vehicle.

In connection with the level of the entire emphasis S and the turning radius the centrifugal force Z arising when driving on a curve can be determined, which attacks just like the total weight G in the entire emphasis S of the vehicle 20. Buckling safety is naturally so long ensured, as that is smaller pull-out torque from the centrifugal force Z arising when driving through the curve, as the restoring moment which is due from the Gewichtskraft G.

In view of by the two wheel load sensors 14, 14 min of the measuring threshold 12 detectable wheel loads R_r, g_1 located transverse to the direction of travel in a line is more detectable beside the total weight G of the vehicle during the mechanism according to invention of also charge-conditional imbalances U and thus side misalignments of the entire emphasis S in the respect on the vehicle longitudinal axis and by means of the tilting equation

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representably, whereby applies: v = vehicle speed

g = acceleration due to gravity

r = turning radius

hs = height of the emphasis S over the roadway

OFF = wheel distance

U = imbalance = $A (R_r/R_1)$

A = axle load

R_r, g_1 = wheel loads

It is apparent that on the basis a such tilting equation the tilting risk bottom consideration of the imbalance can become both wheel sides determined among other things and that traveling speed is assignable, with which with safety no tilting danger exists. With default of a pre-determined safety margin of the allowable traveling speed opposite the traveling speed located at the boundary of the tilting danger thus an effective method is provided for warning the drivers speed superelevated by motor vehicles before when driving on curves.

Claims of DE4416991

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1. As well as methods for warning the drivers of trucks before tilting danger with driving along curves, with before the retraction of a vehicle into a curve the motor vehicle type and the status datas, like vehicle weight and traveling speed, relevant for tilting danger when driving through this curve, detected become in response of the center of gravity of the vehicle mass and of the turning radius the tilting risk when driving through the curve with the detected traveling speed determined and at least superelevated traveling speed an indicative signal with determined tilting danger and/or. when falling below a pre-determined safety margin to the tilting danger triggered, characterised in that for the determination of the total weight G of the respective vehicle (20) will become its wheel loads Rr and g 1 single detected that thereby a simultaneous possible imbalance U on both vehicle sides and/or. the off-setting of the vehicle emphasis S in lateral direction found becomes and that the determination of the tilting risk bottom consideration this imbalance and/or. the off-setting of the vehicle emphasis made.
2. Process according to claim 1, characterised in that beside the total weight G of the vehicle (20) its height and/or. High outline detected and in response of it and on the basis predetermined data for the determined motor vehicle type a weight-dependent estimate of the level hs the vehicle emphasis S made becomes.
3. Verfahren according to claim 1 or 2, characterised in that before and with the retraction of a vehicle (20) into a curve (11) its traveling speed current measured and superelevated traveling speed of indicative signals triggered become until the traveling speed measured in each case is reduced on a measure excluding any tilting risk.
4. Process according to one of claims 1 to 3, characterised in that when driving on a curve their radius over the steering angle of the steering wheel or the directed Fahrzeugachs of the respective vehicle certain and the traveling speed on the basis the vehicle speedometer determined becomes.
5. Verfahren after one of the claims 1 to 4, characterised in that by means of in each case an vehicle-own speed alarm system transmitted and direct data of the respective vehicle processed and for the judgment of the tilting danger to be consulted both from the outside.
6. Process according to one of claims 1 to 5, characterised in that the slip of the wheels of the respective vehicle on the roadway determined and with the judgment of the tilting danger considered becomes.
7. Process according to one of claims 1 to 6, characterised in that regarding slip hazard the road topcondition determined and with the judgment of the tilting danger considered becomes.
8. Process according to claim 7, characterised in that to the judgment of the slip hazard the humidity condition of the roadway determined becomes.
9. Verfahren after one of the claims 6 to 8, characterised in that when falling below a predetermined mature coefficient of adhesion slip hazard an indicative signal triggered becomes.
10. Mechanism to the performing the method after one of the claims 1 to 9, characterised in that in

as straight a distance section before the curve as possible (11) at least two wheel load sensors located in a line transverse to the direction of travel (14, 14 min) of a measuring threshold for seizing the right in each case and left wheel loads R_r, g_1 of a vehicle when over driving the measuring threshold (12) provided are.

11. Mechanism according to claim 10, characterised in that before the curve (11) a sensor for seizing the height and/or. High outline of the respective vehicle (20) provided is.

12. Einrichtung according to claim 10 or 11, characterised in that in direction of travel the rear measuring threshold (12) one on the other subsequent velocity sensors (19) to the current detection of the respective traveling speed provided are.

13. At least mechanism after one of the claims 10 to 12, characterised in that as signal transmitters to the display of superelevated traveling speed at at least an edge of the roadway (10) an active light post (17) provided is.

14. Mechanism according to claim 13, characterized from each other disposed light posts (17), spaced by a signal generator chain out along at least an edge of the roadway (11) in direction of travel.

15. Mechanism after one of the claims 10 to 14, characterised in that for vehicles at the roadside, equipped with corresponding Empfangsund/or transmitting plants, at least a transmitter as signal transmitters and/or a receiver for the exchange of relevant data provided is.

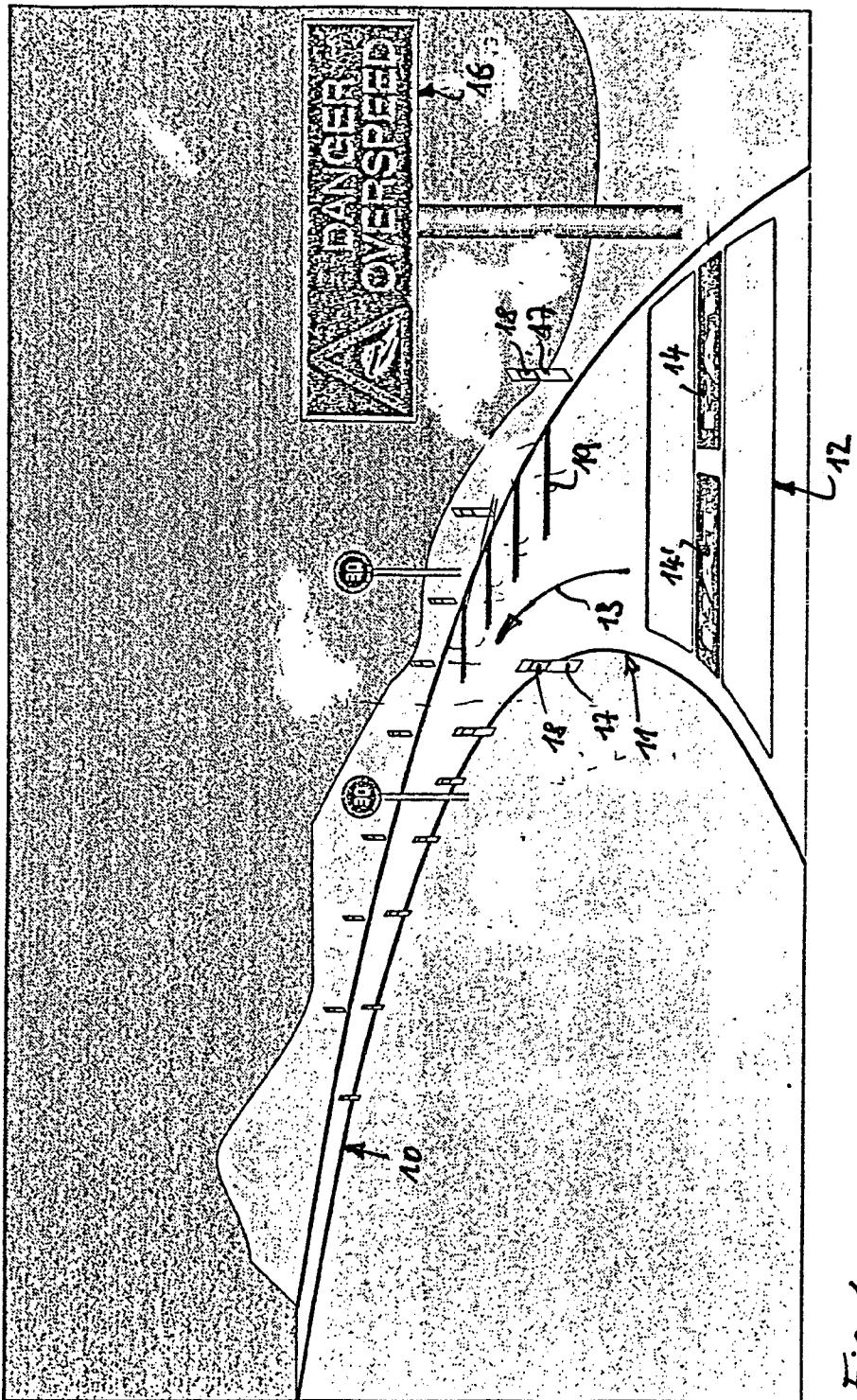
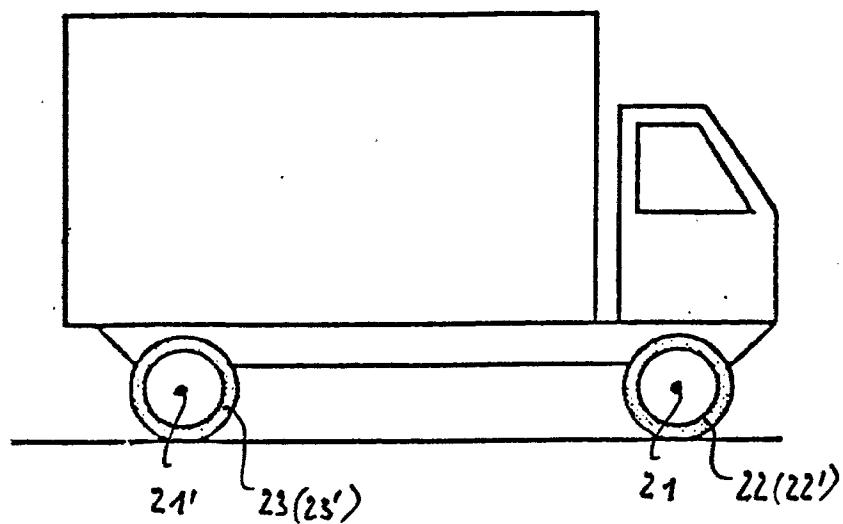


Fig. 1

20

Fig. 2



20

Fig. 3

